

Claims

What is claimed is:

1. A system for actuating a valve element in an engine valve assembly of an internal combustion engine, comprising:
  - a first piston including a first rod and being disposed in a first chamber;
  - a second piston including a second rod having an end separated from the engine valve assembly by a predetermined distance, the second piston being disposed in a second chamber that is in fluid connection with the first chamber such that movement of the first piston causes a corresponding movement of the second piston; and
  - a cam having a cam lobe operatively engaged with the first rod such that rotation of the cam and cam lobe moves the first piston to thereby move the second piston, the cam lobe having a shape adapted to cause the second rod to move through the predetermined distance and to engage the engine valve assembly to move the valve element at a predetermined point in the operating cycle of the internal combustion engine.
2. The system of claim 1, further including a first piston spring operatively engaged with the first piston to bias the first rod away from the cam and cam lobe and a second piston spring operatively engaged with the second piston to bias the end of the second rod away from the engine valve assembly.
3. The system of claim 1, further including a fluid line connecting the first chamber with the second chamber and a fluid supply system having a pump adapted to provide fluid to the fluid line.

4. The system of claim 3, wherein the fluid supply system includes a control valve adapted to control the flow of fluid to the fluid line.

5. The system of claim 4, further including a check valve disposed between the control valve and the fluid line.

6. The system of claim 4, further including a fluid return line providing a fluid pathway between the fluid line and a tank.

7. The system of claim 6, wherein the control valve controls a flow of fluid through the fluid return line.

8. The system of claim 1, further including an adjustment mechanism operatively engaged with the second piston to adjust the predetermined distance between the end of the second rod and the engine valve assembly.

9. A method of actuating a valve element in an engine valve assembly of an internal combustion engine, comprising:

positioning an end of a slave rod connected to a slave piston a predetermined distance from an engine valve assembly;

supplying fluid to a fluid line connecting a master piston having a master rod with the slave piston; and

rotating a cam having a cam lobe operatively engaged with the master rod to thereby move the master piston and cause a corresponding movement of the slave piston and slave rod, the cam lobe having a shape adapted to move the slave rod through the predetermined distance and to engage the engine valve assembly to move the valve element at a predetermined point in the operating cycle of the internal combustion engine.

10. The method of claim 9, further including adjusting the predetermined distance between the end of the slave rod and the engine valve assembly.

11. The method of claim 9, wherein the valve element is moved when a piston disposed in a combustion chamber associated with the engine valve assembly is at or near a top-dead-center position of a compression stroke.

12. The method of claim 9, further including allowing fluid to escape from the fluid line when the engine is experiencing one of a first set of operating conditions.

13. An internal combustion engine, comprising:  
an engine block defining a cylinder;  
an engine piston slidably disposed in the cylinder;  
an engine valve assembly associated with the cylinder and having a valve element moveable between a first position where fluid is prevented from flowing relative to the cylinder and a second position where fluid is allowed to flow relative to the cylinder;

a first piston including a first rod and being disposed in a first chamber;

a second piston including a second rod having an end separated from the engine valve assembly by a predetermined distance, the second piston being disposed in a second chamber that is in fluid connection with the first chamber such that movement of the first piston causing a corresponding movement of the second piston; and

a cam having a cam lobe operatively engaged with the first rod such that rotation of the cam and cam lobe moves the first piston to thereby move the second piston, the cam lobe having a shape adapted to cause the second rod to move through the predetermined distance and to engage the engine valve

assembly to move the valve element from the first position when the engine piston is at a predetermined position within the cylinder.

14. The engine of claim 13, further including a first piston spring operatively engaged with the first piston to bias the first rod away from the cam and cam lobe and a second piston spring operatively engaged with the second piston to bias the end of the second rod away from the engine valve assembly.

15. The engine of claim 13, further including a fluid line connecting the first chamber with the second chamber and a fluid supply system having a pump adapted to provide fluid to the fluid line and a control valve adapted to control the flow of fluid to the fluid line.

16. The engine of claim 15, further including a fluid return line providing a fluid pathway between the fluid line and a tank and wherein the control valve controls a flow of fluid through the fluid return line.

17. The engine of claim 13, further including an adjustment mechanism operatively engaged with the second piston to adjust the predetermined distance between the end of the second rod and the engine valve assembly.

18. The engine of claim 13, wherein the engine valve assembly includes a rocker arm and a pair of engine valves connected by a bridge, and wherein the end of the second rod is adapted to engage the rocker arm.

19. The engine of claim 13, further including a fuel injection system having a rocker arm operatively engaged with the cam lobe.

20. The engine of claim 13, wherein the valve element is moved from the first position when the engine piston is at or near a top-dead-center position of a compression stroke.